

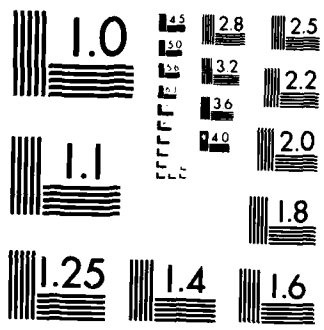
REMOVING EXPORT CREDIT SUBSIDIES TO THE SOVIET BLOC:  
WHO GETS HURT AND BY HOW MUCH?(U) RAND CORP SANTA  
MONICA CA K CRANE ET AL. OCT 84 RAND/P-7028

REMOVING EXPORT CREDIT SUBSIDIES TO THE SOVIET BL  
WHO GETS HURT AND BY HOW MUCH?(U) RAND CORP SANTA  
MONICA CA K CRANE ET AL. OCT 84 RAND/P-7028

F/G 5/3

NL

[illegible]



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS 1963 A

2

AD-A152 558

REMOVING EXPORT CREDIT SUBSIDIES TO THE SOVIET BLOC:  
WHO GETS HURT AND BY HOW MUCH?

Keith Crane  
Daniel F. Kohler

October 1984

DTIC FILE COPY

DTIC  
ELECTE  
APR 17 1985  
E

P-7028

This document has been approved  
for public release and sale; its  
distribution is unlimited.

### **The Rand Paper Series**

**Papers are issued by The Rand Corporation as a service to its professional staff. Their purpose is to facilitate the exchange of ideas among those who share the author's research interests; Papers are not reports prepared in fulfillment of Rand's contracts or grants. Views expressed in a Paper are the author's own and are not necessarily shared by Rand or its research sponsors.**

**The Rand Corporation, 1700 Main Street, P.O. Box 2138, Santa Monica, CA 90406-2138**

## I. INTRODUCTION \*

Under the standard assumptions of neo-classical trade theory, it has been shown that export subsidies are never in the general interest of the donor country, because the subsidy accrues, at least in part, to the importing country and leads to less than optimal resource allocation in the exporting country[1]. Nevertheless export credit subsidies have been a longstanding fixture of international trade. Policymakers have employed them to win export orders in competition with other countries and to subsidize export orders from a sector, if a fall in orders is likely to increase unemployment in that industry.

Despite the prevalence of these subsidies, little effort appears to have been expended to estimate their economic cost or what would transpire if they were eliminated. The purpose of this article is to partially fill this gap. We take two regions, the Soviet Union and Eastern Europe[2], and estimate the likely impact on 1981 exports from the Organization of Economic Cooperation and Development (OECD) to these regions, if credit subsidies had been eliminated in that year.

Due to the variety of forms in which these subsidies are given, data constraints make it impossible to quantify all the transfers implicit in these forms. Therefore, the projections below are restricted to the value of direct and indirect interest rate subsidies on new Western loans granted to Eastern Europe and the Soviet Union in 1981 and the possible effects of their elimination.

---

\*We would like to thank Timothy Quinn for a number of helpful comments and criticisms. Views expressed in this paper are the authors' own and are not necessarily shared by Rand or its research sponsors.

## II. ESTIMATING THE SUBSIDIES

### DIRECT SUBSIDIES

The form and extent of subsidies on exports are limited by the General Agreement on Trade and Tariffs (GATT). This agreement gives the importing government the right to offset subsidies granted by the exporting government through import duties. However, if the government of the importing country has no desire to offset subsidies granted by exporters competing for the same market, GATT does little to regulate subsidies on exports. It is in this area where most of the subsidization of exports occurs today.

The Eastern Bloc is one such market. Western governments compete for sales in this market by subsidizing their exports. To stay within GATT rules, the subsidy is usually not in the form of a rebate on the price of the good or service exported, but instead is granted through preferential borrowing terms for Eastern Bloc importers.

In some OECD countries, these subsidies are granted by special government banking institutions which are empowered to extend loans to foreign purchasers of exported goods at below market rates. Examples of such institutions are the Export-Import Bank of the United States (EXIM Bank) and the Banque Francaise pour le Commerce Exterieur (BFCE) in France. In other countries, the loans are extended by commercial banks, but the interest payments are subsidized by a direct transfer from the government to the bank. In either case, the borrower receives a *direct* subsidy from the government advancing the credit, since he pays less than the cost of the money to the lending government. This difference

between the cost of the money to the lending government and the cost to the borrower comprises the *direct* export credit subsidy.

In recent years the OECD countries have been negotiating limits on the use of interest rate subsidies for export financing. The negotiations have taken place within the framework of the OECD which, unlike GATT, has no power to set up legally binding multinational treaties. Instead, these negotiations have led to a series of 'gentlemen's agreements' and a 'consensus' on minimum rates to be charged on government-backed loans to foreign purchasers of exported goods and services.

The consensus rates are organized in a threetier system. Countries are classified into three categories according to their per capita GNP. Low income countries are granted the most favorable rates, while high income countries get the least favorable ones. Until 6 July 1982, the Soviet Union and the entire Eastern Bloc were in the intermediate category, and thus, under the gentlemen's agreement, had access to import credits at lower rates than Western industrialized countries. Since that date, the Soviet Union along with East Germany and Czechoslovakia have been placed in the highest category; they now pay the highest consensus rates (12.15 percent on medium term loans as of July 1983). However, this rate for high income countries is still below market rates in some countries, despite a decline in this differential caused by the recent fall in worldwide interest rates.

The consensus rates for the Soviet Bloc and the time they were in force are given in Table 1. For comparison we have included the U.S. treasury bill rates for comparable time periods and maturities. The difference, and thus the direct subsidy, was quite considerable in 1981,

Table 1

OECD CONSENSUS RATES  
(Finance charges in percent, p.a.)

Country Category	4/1/78-6/30/80 2-5 yr	7/1/80-11/15/81 2-5 yr	11/16/81-7/5/82 2-5 yr	7/6/82-10/15/83 2-5 yr	10/16/83-Present 2-5 yr
I	7.75	8.00	8.75	11.00	11.25
II	7.25	7.75	8.00	8.50	10.00
III	7.25	7.50	7.75	10.00	10.00
U.S. Gov. Bonds	9.33	11.39	13.72	12.92	11.34

SOURCES: U.S. Treasury Department, various memos; International Monetary Fund (IMF), International Financial Statistics, various years.  
Category I (relatively rich countries) including since 7/6/82 the Soviet Union, Czechoslovakia, and East Germany, who were in Category II before,

Category II (intermediate countries) including Bulgaria, Hungary, Poland, Romania, Yugoslavia and since 7/6/82 Cuba and North Korea, who were in Category III before,

Category III (relatively poor countries) including China and Vietnam.



Table 2

AVERAGE YIELD ON GOVERNMENT BONDS WITH MATURITIES OF  
ONE YEAR IN SELECTED OECD COUNTRIES (1981)

Country	Average Yield
Australia	13.96
Austria	10.61
Belgium	13.71
Canada	15.22
Denmark	18.92
Finland	10.20
France	15.66
Ireland	17.26
Italy	20.58
Japan	8.66
Netherlands	11.55
Norway	12.31
Portugal	16.71
Sweden	13.49
Switzerland	5.57
United Kingdom	14.74
United States	13.72
West Germany	10.38

SOURCE: IMF, International  
Financial Statistics, 1981

Accession For

NTIS ABSTRACT ☒

ERIC ☐

Unpublished ☐

Journal ☐

By \_\_\_\_\_

Distribution/

Availability Codes

Dist Avail and/or Special

A-1

but was even larger for some other lending countries (see Table 2).

To calculate the direct subsidy on new loans in 1981, Kohler [3] used the OECD consensus rates to compute discounted finance charges actually paid on these loans. These costs were then subtracted from the discounted financing costs of the loans, computed as if they had been granted at rates equal to those charged on government bonds in the lending countries (see Table 2)[4]. The results of these calculations are reported in Table 3.

Table 3  
DIRECT SUBSIDIES TO THE SOVIET BLOC ON NEW LOANS IN 1981

(In millions of dollars)

	New Obligations (millions of \$'s)	Consensus Rate (Short Term) (%)	Consensus Rate (Long Term) (%)	Subsidy Total (P.V.) <sup>a</sup> (millions of \$'s)
USSR	5,763.1	8.0	8.5	498.1
Bulgaria	219.0	8.0	8.5	16.4
Czechoslovakia	267.0	8.0	8.5	23.7
GDR <sup>b</sup>	1,631.0	8.0	8.5	94.7
Hungary	99.0	8.0	8.5	14.4
Poland	2,778.0	8.0	8.5	338.8
Romania	323.0	8.0	8.5	41.5
Unallocated	1,299.5	8.0	8.5	93.9
Total	12,379.6			1,121.5

SOURCE: Kohler [1984].

<sup>a</sup>Present value of savings in financial costs.

<sup>b</sup>West German loans to the GDR are not included.

It is impossible to ascertain whether all the loans officially supported by OECD governments were indeed made at the consensus terms. Most OECD countries are very tight-lipped about the volume of loans subsidized in this manner, and especially about who the borrowers are. Some officially-supported loans profit only from a risk guarantee from the lending government, but are otherwise extended at "market rates." For such loans there would be no direct subsidy, only an indirect one.

There is, however, evidence that some of the officially-supported loans, especially to the Eastern Bloc, go at rates even below consensus rates[5]. The figures given in Table 2 are based on the assumption that all officially-supported loans were made at either the consensus rates or the government bond rates, whichever was lower. They thus represent a compromise. The total direct subsidy would be smaller, if a large fraction of officially-supported loans were only given a government guarantee and not a direct subsidy, and larger, if a sizeable fraction of officially-supported loans were extended at rates below the consensus rates.

#### INDIRECT SUBSIDIES

There are several indirect ways in which OECD governments subsidize their exports. In our calculations we consider only the most important: assumption of repayment risks by the exporting government. This is the case irrespective of whether the government extends the loan itself, with or without a direct subsidy, or whether it only provides a repayment guarantee to a private lender. In either case the borrower is able to obtain loans at lower rates than if the exporting government was not absorbing the risk.

Risks to lenders in international financial markets are usually divided into two categories: commercial risks and political risks. Commercial risks are those emanating from private debtors and include bankruptcy and fraud (delkredere risks). Political risks are all risks which are out of the control of the private debtor. They include war, civil unrest, inconvertibility of the importing country's currency and national bankruptcy, as well as all other acts by the importing government which make it impossible for the lender to receive repayment.

When dealing with centrally planned economies in which enterprises are owned by the government, the decision to declare an enterprise insolvent is considered a political decision, not one dictated by the market. Consequently, commercial risks on Soviet Bloc loans are usually subsumed under political risks.

In order to quantify the indirect subsidy, we need to know the interest rate at which the loans would have been made if the exporting government had not assumed the risk. This hypothetical question can be answered readily, if the risks are known. Given a specific risk of not receiving repayment, expressed by a probability, the interest rate can be calculated at which the expected return of such a risky investment equals the return on a risk-free alternative. A risk-neutral lender would be indifferent between lending to the risky borrower at the higher interest rate or investing his money in risk-free assets at the lower interest rate. The riskier a borrower is perceived to be (the higher his perceived probability of nonpayment), the larger this spread is.

In international lending these risks (probabilities of nonpayment) are not well known. Nevertheless, by observing transactions made without the benefit of government guarantees and by analyzing the interest rates charged on guaranteed loans where lenders have to carry some residual risk themselves, one can arrive at an estimate of the market's perceptions of risks. This is the only relevant measure of risk as far as the question of what interest rate would be charged in the absence of government guarantees is concerned. It is the aggregate market's perception of how risky a borrower is that would determine what spread over the risk-free interest rate he would have to pay.

Kohler [6] arrives at an estimate of the market's risk perception through an analysis of private bank forfaiting rates[7]. In a forfaiting transaction, the forfaiteur (i.e., the bank) purchases at a discount an obligation while forfaiting its right of regress on the seller (i.e., the original lender) in case of nonpayment by the obligor (i.e., the borrower). The more risky the bank considers the borrower to be, the higher the discount rate it will apply. It is possible to infer the forfaiteur's perception of risk by observing the extent to which a forfaiting discount rate for a risky borrower, e.g., Poland, exceeds the discount rate for essentially risk-free loans, e.g., U.S. government securities.

Given an estimate of the perceived risks, one can readily calculate the interest rates that a risk-neutral lender would demand from a risky borrower. By comparing the financing costs at this interest rate to the financing costs at the risk-free rate one can obtain an estimate of the indirect subsidy.

Except for loans made directly by the exporting governments, the interest rate on guaranteed loans is usually slightly greater than the yield on government bonds, because in most countries government insurance and guarantees are not free. A fee of 10 to 120 cents per hundred dollars guaranteed is often charged by the government agency that issues the insurance and guarantees; the lenders are also often required to carry a certain fraction of the risk themselves (up to 15 percent) in the form of coinsurance. The fees collected, however, often fail to cover the actual losses of the official insurers and in most cases these fees only marginally reduce the subsidies. Nevertheless, they are accounted for in the calculation of the subsidies[8].

These insurance premiums, guarantee fees, and coinsurance requirements vary from country to country. Some exporters, among them the United States, require no coinsurance on political risks. Some differentiate their fees by borrowing countries (United Kingdom, France, Japan); most do not. Furthermore, a considerable number of exporting governments consider such details confidential and publish neither the rates charged to lenders nor the coinsurance requirements. For these countries we assumed an average fee of 50 cents per hundred dollars per year and a coinsurance requirement of 5 percent. These figures roughly correspond to the average for the countries which make such data available[9].

Kohler's estimates, presented in Table 4, were calculated assuming fees and coinsurance requirements applied to all officially-supported loans. This almost certainly leads to an overestimate of these costs, since some loans, direct loans by governments, for example, enjoy the benefits of government backing without being subject to the fees and charges. Consequently, the estimates of the indirect subsidy are probably too low.

During the year 1981 private market perceptions of the risks associated with lending to the Soviet Bloc rose considerably (columns 2 and 4, Table 4). Accordingly, the estimate of total indirect subsidies is over 50 percent larger if we use the perceived risk probabilities from the fall of 1981 rather than from the spring. In our simulations we use the arithmetic average, which is given in the last column of Table 4.

Table 4  
INDIRECT SUBSIDIES TO THE SOVIET BLOC ON NEW LOANS IN 1981  
(In millions of dollars)

	Indirect Subsidy					Mean Indirect Subsidy
	New Obligations	Lower Bound Risk <sup>a</sup> (%)	Subsidy	Upper Bound Risk <sup>b</sup> (%)	Subsidy	
USSR	5,763.1	2.17	286.5	1.69	217.4	252.0
Bulgaria	219.0	3.71	22.3	3.86	23.2	22.8
Czechoslovakia	267.0	2.89	15.2	4.18	22.4	18.8
GDR <sup>c</sup>	1,631.0	2.89	137.8	4.30	267.6	202.7
Hungary	99.0	2.15	5.9	2.46	6.9	6.4
Poland	2,778.0	7.15	470.0	13.78	818.7	644.3
Romania	323.0	3.30	35.6	3.93	42.4	39.0
Unallocated	1,299.5	5.16 <sup>d</sup>	210.6	9.17 <sup>d</sup>	413.0	311.8
Total	12,379.6		1,183.9		1,811.6	1,497.8

SOURCE: Kohler [1984].

<sup>a</sup> March 1981

<sup>b</sup> September 1981

<sup>c</sup> West German loans to East Germany are not included.

<sup>d</sup> Weighted average of all East European risks.

Table 5 summarizes the subsidy estimates. They are quite substantial, exceeding 2.6 billion dollars, which on a total volume of officially-supported loans of 12.4 billion amounts to over 20 percent. In the remainder of this article we shall analyze how effective these resource transfers were at increasing Western exports to the Soviet Bloc.

Table 5  
CREDIT SUBSIDIES TO THE SOVIET BLOC IN 1981

(In millions of dollars)

	Total Bloc	Soviet Union	Eastern Europe
Direct interest rate subsidy	1121	498	623
Indirect subsidy through risk assumption	1498	252	1246
Total credit subsidy	2619	750	1869



### III. FOREIGN TRADE IN CENTRALLY PLANNED ECONOMIES

#### THE IMPORTANCE OF NONMARKET DECISIONS

Neoclassical trade theory assumes changes in national income and relative prices are the primary determinants of trade flows. Consequently, most empirical investigations of changes in import flows concentrate on the estimation of the income and price elasticities of imports[10]. Due to the limited role of markets in Soviet-type economies, estimation of these elasticities must be handled with care. Since domestic currencies in Soviet-type economies are inconvertible and the state has a monopoly on foreign trade, neither consumers nor firms are permitted to freely purchase goods from abroad; planners' preferences control foreign trade flows. In other words, consumers are not at liberty to convert their domestic incomes into imports.

Planners, on the other hand, face a different problem. In Soviet-type economies, as opposed to market economies of similar size and development, a much greater share of output must be classified as nontraded goods. Due to deficiencies in marketing, technological level, and product quality, Soviet-type economies have difficulty in exporting to hard currency markets, especially since price competition, at least in manufactures, is restricted by the threat of antidumping suits, and domestic demand chronically exceeds supply. These rigidities impose binding constraints on the amount of hard currency that can be earned and thus on total expenditures on hard currency imports.

The linkage between world market price changes and trade flows is weaker in these economies than it is in the West. Foreign exchange is allocated administratively, not to the highest bidder. Importers receive quotas in the form of plan targets from the Ministry of Foreign Trade. These targets have the force of law[11]. Quotas are set in value or quantity terms. They are allocated through bargaining between the central authorities, branch ministries (which represent the final users), and foreign trade organizations which will make the actual purchase. The final allocation of the available hard currency is determined by bargaining clout, which is a function of central preferences and enterprise management ties to their superiors.

When drawing up import targets, planners assume a fixed amount of hard currency and a set of projected world market prices. If price fluctuations differ from those forecast, planners are faced with a problem since planned expenditures and quantities diverge. One method for dealing with this problem has been to adjust quantities, up or down, so that expenditures stay at planned levels[12].

An indirect test of this model of foreign trade decisionmaking in Soviet-type economies can be made by estimating the price elasticities of import demand. If this budgeting model of the Soviet foreign trade system is correct, one would expect to find zero cross price elasticities and own price elasticities of negative one for hard currency imports in the different commodity groups. Even though bureaucrats in this model do not necessarily behave like economic agents in market economies, they reveal "price response" in the form of significant own price elasticities for commodities. These elasticities

are, however, an artifact of the constraints imposed by import plan targets.

In Appendix B we present price elasticity estimates for Soviet and East European demand for imports from market economies for four commodity groups. The results strongly support the hypothesis outlined above. The estimated own price elasticities are very close to negative one and none of the cross price elasticities are significantly different from zero.

The effect of export subsidies in such an environment is very limited. A one percent increase in hard currency available to Soviet Bloc planners through Western export subsidy programs leads to a one percent increase in import volume and in hard currency expenditures. The West's net export earnings after subtracting the subsidy remain unaltered, even though more goods are shipped. In other words, the Soviet Bloc countries do not increase their imports over and above the amount of the subsidy they receive.

Export subsidies can be characterized as either product-specific or general. Product-specific subsidies lower the price of a good while general subsidies increase the hard currency available to the recipient. Credit subsidies on untied bank loans are obviously general. But even subsidies on export credits extended to finance particular imports have to be considered more general than specific. Since credit transactions are handled centrally by the Foreign Trade Bank, all credit subsidies reduce the borrowing costs of this bank and thus increase the hard currency available overall. This enables the recipient to increase imports by the amount of the subsidy.

The effect of the subsidy on imports of particular commodity groups is determined by their elasticities with respect to the hard currency available. These elasticities are analogous to the income elasticities of consumer demand theory. Given that the hard currency constraint--like an income constraint--is binding, the change in overall expenditures on imports has to equal the amount of the subsidy.

#### ESTIMATING THE ELASTICITY OF IMPORTS WITH RESPECT TO HARD CURRENCY RESOURCES

The equations used to estimate these elasticities were derived from a linear expenditure system adapted from consumer demand theory. In this model hard currency receipts impose a budget constraint on purchases of hard currency imports by the country. After debt-service payments have been made, the central authorities allocate the remaining earnings for purchases of different types of imports. Elasticities are calculated with respect to this remainder, *hard currency resources*[13].

The linear expenditure system employed has the attractive features that it is consistent with utility maximization, satisfies the adding up constraint (i.e., the expenditure shares add up to one), and leads to a system of demand equations that are linear in the parameters, even though the parameters are subject to some nonlinear constraints[14]. The model used is:

$$(1) \quad p_i M_i = p_i \gamma_i + \beta_i (y - \sum p_i \gamma_i)$$

where

$p_i$  = price of good  $i$

$M_i$  = import of good  $i$

$y$  = hard currency resources, and

$\gamma, \beta$  = parameters

Samuelson has offered the interpretation that  $p_i \gamma_i$  constitutes noncompressible expenditures on a commodity and  $\beta_i$  equals the percentage of discretionary resources that the consumer (or planner) will spend on it[15]. In other words, the planner considers purchases of  $p_i \gamma_i$  essential for the operation of the economy; the  $\beta$ 's determine how he divides the remaining hard currency resources among the various commodities.

The elasticity of imports from category  $i$  with respect to hard currency resources ( $y$ ) is equal to

$$\zeta_{iy} = \beta_i / w_i$$

where  $w_i$  = the share of the commodity in total expenditures. The adding up constraint requires that:

$$\sum (\zeta_{iy} \cdot w_i) = 1$$

which implies that  $\sum \beta_i = 1$ . This constraint is imposed by dropping one of the equations during estimation and calculating its parameters from the constraint[16].

The parameters of the model were estimated using time series for the value of market economy exports to the Soviet Bloc by commodity group (SITC nomenclature) between 1970 and 1980[17]. Hungarian import price indices for hard currency imports by commodity were used as a

proxy for the price data[18]. These price indices were chosen because a series for the whole Soviet Bloc was not available and the composition of Hungarian hard currency imports more closely reflects that of other Soviet Bloc countries than would the composition of a Western nation. The Hungarian indices for the full period were only available according to the nomenclature used by the Council of Mutual Economic Assistance (CMEA). Differences in the composition of commodity groups in the SITC and CMEA systems were judged to be insignificant at the level of aggregation used.

The estimates of resource elasticities for the various commodity groups are shown in Table 6. The common belief that the elasticity of manufactures with respect to hard currency resources is higher than that of food or raw materials is clearly refuted. In fact, our point estimates indicate the opposite. Food imports have been elastic with

Table 6

ESTIMATED ELASTICITIES OF SOVIET BLOC HARD CURRENCY IMPORTS  
WITH RESPECT TO HARD CURRENCY RESOURCES

Commodity and SITC No.	Elasticities	
	Soviet Union	Eastern Europe
Food (0-1)	1.20 (.053)	1.15 (.098)
Raw materials (2,3,5)	.92 (.183)	1.07 (.132)
Machinery (7)	.87 (.129)	.91 (.127)
Intermediate and consumer goods (6,8)	.96 (.096)	.92 (.095)

NOTE: Conditional standard errors in parentheses.

respect to hard currency resources for both the Soviet Union and Eastern Europe, whereas imports of manufactured goods such as machinery have been inelastic. The difference between the two elasticity estimates is not highly significant statistically. Nevertheless, it runs contrary to the general notion that machinery imports are the first to be cut when hard currency earnings decline.

#### IV. MEASURING THE EFFECTS OF SUBSIDIES ON EXPORTS TO THE SOVIET BLOC

##### METHOD OF CALCULATION

We are now in a position to quantify the likely effects of removing export credit subsidies on Western exports to the Soviet bloc. We assume that in the event of a removal of the subsidies the importing countries would decide to reduce their imports in the same year by the discounted value of the subsidy. This assumption is justified if we also assume that Western lenders take the debt-service capacity of their borrowers into account, i.e., lenders would have been reluctant to make further loans to Eastern Europe in 1981 because future debt-service capacity would have been inadequate.

The following simulation shows how the Soviet Union and Eastern Europe would have reduced their imports in 1981 if their borrowings of hard currency had been reduced by an amount equal to the subsidies on officially-supported loans in that year. This reduction in borrowing could either stem from an importer trying to maintain his debt service burden at the same level in the face of reduced subsidies or it could be imposed by the lenders who would not permit the borrower to increase his debt service burden. Either case would result in a reduction in borrowings by an amount equal to the value of the subsidy in 1981.

We conduct this exercise for the most recent year for which data were available--1981. During that year, the Soviet Bloc, despite rescheduling by Poland, received over 12 billion dollars in officially-supported new loans. If the region would have had to borrow in the unsubsidized financial markets, it could have raised less than 10



billion dollars without substantially increasing its future debt service burden. To maintain debt service payments at the same level, the countries would have had to reduce borrowing by the amount of the subsidy, roughly \$2.6 billion. The effects of this reduction in available hard currency resources on hard currency imports are estimated in the next two subsections.

### EFFECTS ON THE HARD CURRENCY IMPORTS OF THE SOVIET BLOC

Given the elasticities estimated in Sec. III and the estimate of the subsidy, the share of the decline in total hard currency imports by the Soviet Bloc for four commodity groups may be calculated. These shares are derived by multiplying the estimates of the  $\beta$ 's in Eq. (1) by the total decline in hard currency imports (which is assumed to equal the total value of the subsidy). The  $\beta$ 's represent the proportion of a decline in "discretionary" income which would be made up by reducing expenditures on the particular commodities.

What follows is a simulation of what would have happened to hard currency exports to the Soviet Bloc in 1981 if subsidies had not been granted. It is not a forecast. We postulate a scenario of "no credit subsidies in 1981" and estimate the likely volume and composition of OECD exports to the Soviet Bloc. Our results are, of course, conditioned by our assumptions and estimates.

Declines in imports originating from the OECD were estimated by multiplying the reduction in hard currency imports of these commodities by the share of the OECD in total imports of the commodity from market economies. The rationale for this is the following: export credit subsidies from one country liberate hard currency which can be spent elsewhere. If these subsidies are reduced, imports have to be reduced,

but these reductions will be determined by the needs of the importing country, not by who supplies the imports.

The estimates of declines in exports are given in Table 7. Interestingly, the table indicates that the commodity groups which will suffer the greatest decline will be raw materials (which include fuels, chemicals, and other raw materials) and intermediate and consumer goods. Since substantial shares of these exports are provided by non-OECD exporters or are reexported by OECD members from non-OECD suppliers, a significant part of the subsidies appears to have gone to increasing Soviet Bloc imports from non-OECD suppliers. The smallest decline in imports would have taken place in machinery, the area toward which subsidies have traditionally been targeted and often considered the most politically-sensitive sector due to employment effects.

Table 7  
POTENTIAL DECLINES IN EAST BLOC HARD CURRENCY IMPORTS BY COMMODITY

Commodity	Decline in Imports (in millions of \$'s)					
	Bloc		Soviet Union		Eastern Europe	
	Total	OECD	Total	OECD	Total	OECD
Food (0-1)	612	393	257	131	355	262
Raw materials (2,3,5)	764	488	139	93	625	395
Machinery (7)	592	589	156	155	436	434
Intermediate and consumer goods (6,8)	651	594	198	183	453	411
Total	2,619	2,064	750	562	1,869	1,502

# DECLINES IN EXPORTS TO THE SOVIET BLOC FROM PARTICULAR OECD COUNTRIES

An attempt was also made to estimate possible declines in exports for several OECD countries or country groups by commodity. These estimates are given in Tables 8 through 10.

As can be seen, the decline in the volume of OECD exports would have been small, less than 5 percent of the total in 1981. If declines in each commodity group are assumed to be distributed among the countries in proportion to their shares in OECD exports of each commodity, the Common Market would have experienced the greatest fall in percentage terms and Canada the least, but no country or country group

Table 8  
PROJECTED DECLINES IN OECD EXPORTS TO THE EAST BLOC  
BY COMMODITY GROUP AND COUNTRY--1981

Country	Total Exports	Total Decline	Food	Raw Materials	Mach- inery	Intermediate and Consumer Goods
Europe	33,524	1,656	205	407	512	532
(EEC <sup>a</sup> )	(19,116)	(1,008)	(140)	(264)	(317)	(287)
Canada	1,893	55	49	3	2	1
U.S.	4,261	182	126	33	18	5
Japan	4,017	134	0	22	57	55
Australia and New Zealand	1,159	37	13	23	0	1
Other <sup>b</sup>	54	0	0	0	0	0
Total OECD	44,908	2,064	393	488	589	594

<sup>a</sup>European Economic Community--included in the total for Europe above.

<sup>b</sup>Includes South Africa and omissions.

would have experienced more than a 6 percent fall in exports and none less than 2 percent. In terms of value, elimination of the subsidies would appear to have had the greatest impact on exports of intermediate and consumer goods, followed by machinery exports. However, as the elasticity estimates show, the largest relative reductions would have taken place in food imports.

Since jobs often appear to be most closely tied to output of manufactures, export credit subsidies have generally been rationalized on the basis of preserving employment. However, if all subsidies had been eliminated, exports of manufactures (machinery plus intermediate and consumer goods) would have declined by \$1183 million, 4.8 percent of total manufactured exports by the OECD to the Soviet Bloc; direct export credit subsidies, i.e., out-of-pocket costs to lending governments, alone equaled \$800 million.

Because exports are assumed to decline according to shares in total OECD exports to the Bloc, Western Europe would have borne the brunt of the decline, about 80 percent. However, a third of this would be due to decreases in food and raw material exports. Total U.S. exports would probably have declined by about 4.3 percent. Reductions would have been almost exclusively confined to declines in exports of agricultural goods and raw materials; machinery exports to this area would be affected very little.

Table 9

PROJECTED DECLINES IN OECD EXPORTS TO THE SOVIET UNION  
BY COMMODITY GROUP AND COUNTRY--1981

Country	Total Exports	Total Decline	Food	Raw Materials	Mach- inery	Intermediate and Consumer Goods
Europe	17,609	391	57	69	121	144
(EEC <sup>a</sup> )	(8,722)	(191)	(36)	(35)	(58)	(62)
Canada	1,560	31	30	1	0	0
U.S.	2,357	49	32	8	8	1
Japan	3,259	72	0	8	26	38
Australia and New Zealand	929	19	12	7	0	0
Total OECD	25,714	562	131	93	155	183

<sup>a</sup>Included in the total for Europe above.

Table 10

PROJECTED DECLINES IN OECD EXPORTS TO EASTERN EUROPE  
BY COMMODITY GROUP AND COUNTRY--1981

Country	Total Exports	Total Decline	Food	Raw Materials	Mach- inery	Intermediate and Consumer Goods
Europe	15,915	1,265	148	338	391	388
(EEC <sup>a</sup> )	(10,394)	(817)	(104)	(229)	(259)	(225)
Canada	333	24	19	2	2	1
U.S.	1,904	133	94	25	10	4
Japan	758	62	0	14	31	17
Australia and New Zealand	230	18	1	16	0	1
Total OECD	19,194	1,502	262	395	434	411

<sup>a</sup>Included in the total for Europe above.

## V. CONCLUSIONS

Both direct and indirect subsidies on export credits granted to the Soviet Bloc in 1981 were substantial--over \$2.6 billion. The Soviet Union alone received close to a third of this amount. Direct subsidies comprised a sizable share in this total, over 40 percent.

The composition of hard currency exports to the Soviet Bloc appears to depend primarily on the amount of hard currency available. As more hard currency becomes available, imports increase at different rates, with food imports increasing the most rapidly, and machinery imports the least. Own price elasticities hover around negative one for these countries. This indicates that price rises cause a decline in the quantity purchases such that total expenditures on the commodity stay the same. It is as if planners allocate a fixed amount of hard currency for purchases of particular commodities and do not adjust these amounts for changes in relative prices.

If subsidies had been eliminated in 1981, our calculations indicate total OECD exports to the Bloc would have declined by less than 5 percent. None of the countries of the OECD would have experienced more than a 6 percent decline in total exports and none less than a 2 percent fall. The greatest declines in hard currency imports as a whole would have occurred in purchases of raw materials. The greatest reductions in OECD exports to the Bloc would have occurred in exports of intermediate and consumer goods, followed by machinery. Differences across commodity groups would not have been substantial, however. The total decline in these two types of manufactured exports would have been roughly \$1200

million, less than half the value of the total subsidy extended by the West.

In conclusion, the primary effect of export subsidies to the Soviet Bloc has been to provide the Bloc with increased supplies of hard currency, a substantial proportion of which is used to import food and raw materials often purchased from non-OECD suppliers. They do not appear to have contributed to an expansion of trade over and beyond the amount of the subsidy.



## APPENDIX A ESTIMATION PROCEDURE

The problem with estimating Eq. (1) in the text (reproduced below), is that the  $\gamma$ 's are needed to estimate the  $\beta$ 's.

$$(A.1) \quad p_i M_i = p_i \gamma_i + \beta_i (y - \sum p_i \gamma_i)$$

In order to generate estimates of the  $\beta$ 's some method had to be found to calculate a proxy for supernumerary income,  $y - \sum p_i \gamma_i$ . This proxy was constructed by regressing nominal total hard currency imports [19] (hard currency expenditures) on nominal imports of three commodities[20]:

$$(A.2) \quad p_i M_i = \beta_i \cdot y$$

Equation (1) was then rewritten as:

$$(A.3) \quad M_i = \gamma_i (1 - \beta_i) p_i + \gamma_j (-\beta_i) p_j + \gamma_k (-\beta_i) p_k + \gamma_l (-\beta_i) p_l$$

and the resulting set of  $\beta$ 's was used to create a new set of prices:

$(1 - \beta_i) p_i = P_i$  and  $\beta_j p_j = P_j$ . These prices were then stacked and regressed on the residuals from the regressions on nominal total imports in order to estimate the  $\gamma$ 's.

$$(A.4) \quad \begin{bmatrix} \text{res}_i \\ \text{res}_j \\ \text{res}_k \end{bmatrix} = \gamma_i \begin{bmatrix} P_i \\ p_i \\ p_i \end{bmatrix} + \gamma_j \begin{bmatrix} P_j \\ p_j \\ p_j \end{bmatrix} + \gamma_k \begin{bmatrix} P_k \\ p_k \\ p_k \end{bmatrix} + \gamma_l \begin{bmatrix} P_l \\ p_l \\ p_l \end{bmatrix}$$

Supernumerary income,  $y - \sum p_i \gamma_i$ , was then calculated using these estimates of the  $\gamma$ 's:

$$(A.5) \quad Y^{*1} = Y - \gamma_i p_i - \gamma_j p_j - \gamma_k p_k - \gamma_l p_l$$

Differences were then formed using Eq. (1) of the form:

$$(A.6) \quad \begin{aligned} p_i M_i - p_j M_j &= \gamma_i p_i - \gamma_j p_j + (\beta_i - \beta_j) Y^{*1} \\ p_i M_i - p_k M_k &= \gamma_i p_i - \gamma_k p_k + (\beta_i - \beta_k) Y^{*1} \\ p_i M_i - p_l M_l &= \gamma_i p_i - \gamma_l p_l + (\beta_i - \beta_l) Y^{*1} \end{aligned}$$

The fourth equation,  $p_i M_i - p_k M_k$ , is a linear combination of the other three and hence redundant.

These equations were stacked in the manner depicted in Eq. (7) and ordinary least squares was used to provide new estimates of the coefficients.

$$(A.7) \quad \begin{bmatrix} p_i M_i - p_j M_j \\ p_i M_i - p_k M_k \\ p_i M_i - p_l M_l \end{bmatrix} = \gamma_i \begin{bmatrix} p_i \\ p_i \\ p_i \end{bmatrix} + \gamma_j \begin{bmatrix} -p_j \\ 0 \\ 0 \end{bmatrix} + \gamma_k \begin{bmatrix} 0 \\ -p_k \\ 0 \end{bmatrix} + \gamma_l \begin{bmatrix} 0 \\ 0 \\ -p_l \end{bmatrix} \\ + \alpha_1 \begin{bmatrix} Y^{*1} \\ 0 \\ 0 \end{bmatrix} + \alpha_2 \begin{bmatrix} 0 \\ Y^{*1} \\ 0 \end{bmatrix} + \alpha_3 \begin{bmatrix} 0 \\ 0 \\ Y^{*1} \end{bmatrix}$$

These new estimates of the  $\gamma$ 's were then used to recalculate  $Y^*$ , supernumerary income, in Eq. (A.6) and the new estimates were used to obtain another round of estimates in Eq. (A.7). Iterations continued until estimates changed by less than 0.1 percent. This occurred after five iterations in the case of the Soviet Union and after six iterations in the case of Eastern Europe. The elasticities given in Table 6 were then calculated from the estimates of the alphas.

The standard errors given for the elasticities in Table 5 were derived using linear transformations of the standard errors of the alphas in (A.7).

## APPENDIX B PRICE ELASTICITY ESTIMATES

Table B.1 presents the estimates for the parameters of Eq. (A.7).  
Conditional standard errors are given in parentheses.

Table B.1  
PARAMETER ESTIMATES FOR EQ. (A.7)

Parameter <sup>a</sup>	Soviet Union	Eastern Europe
$\gamma_F$	-1.236 (.679)	-.939 (.652)
$\gamma_R$	.141 (1.213)	-1.365 (1.320)
$\gamma_M$	.503 (1.104)	-.374 (1.124)
$\gamma_C$	-.054 (.460)	-.550 (.360)
$\alpha_1$	.158 (.040)	-.145 (.044)
$\alpha_2$	.135 (.034)	-.043 (.036)
$\alpha_3$	.078 (.031)	-.052 (.030)
$\beta_F$	.3428	.1899
$\beta_R$	.1848	.3348
$\beta_M$	.2080	.2332
$\beta_C$	.2643	.2421
Degrees of freedom	26	26
Adjusted R squared	.724	.905
Durbin-Watson	1.232	1.314

<sup>a</sup>For an interpretation of these parameters, see Appendix A.

Own price and cross price elasticities were calculated from these parameter estimates using the following equations:

$$(B.1) \quad \zeta_{ii} = [(1 - \beta_i \gamma_i) p_i / p_i M_i] - 1$$

$$(B.2) \quad \zeta_{ij} = \gamma_j (\beta_i p_j) / p_i M_i$$

The results of these calculations are given in Table B.2.

Table B.2

PRICE ELASTICITIES AND IMPORT SHARES BY COMMODITY

Soviet Union				
	Food	Raw Materials	Machinery	Intermediate and Consumer Goods
$P_F$	-1.168	-.009	-.032	.003
$I_R$	.068	-.969	-.025	.003
$P_M$	-.064	-.007	-.910	.002
$P_C$	.070	-.007	-.026	-1.007
Shares	.286	.200	.238	.276
Eastern Europe				
	Food	Raw Materials	Machinery	Intermediate and Consumer Goods
$P_F$	-1.282	.087	.002	.003
$P_R$	.061	-1.161	.002	.003
$P_M$	.052	.069	-1.006	.003
$P_C$	.053	.070	.002	-1.008
Shares	.190	.335	.233	.242

## REFERENCES

1. 1. Caves, Richard, and Ronald Jones, *World Trade and Payments: An Introduction*, 3rd ed., Little, Brown and Co., Boston, 1981.
2. 2. For the purposes of this report Eastern Europe is defined as Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania.
3. 3. Kohler, Daniel F., *Economic Cost and Benefits of Subsidizing Western Credits to the East*, The Rand Corporation, R-3129-USDP, July 1984.
4. 4. In some OECD countries, bond yields are below consensus rates (Japan and West Germany, for example). Loans granted by these countries are assumed to be extended at the government bond rate and thus contain no direct subsidy.
5. 5. *East-West*, "Italy to Buy Soviet Gas: On What Terms?" No. 329, 20 December 1983, p. 1.
6. 6. Kohler, op.cit.
7. 7. The banking term 'forfaiting' is derived from the French expression, 'a forfait'; hence the non-standard spelling in the English language.
8. 8. Kohler, op.cit.
9. 9. Organization for Economic Cooperation and Development, *The Export Credit Financing Systems in OECD Member Countries*, Paris, 1982.
10. 10. Magee, Stephen P., "Prices, Incomes, and Foreign Trade," in Peter Kenen (ed.), *International Trade and Finance*, Cambridge University Press, Cambridge, 1975.
11. 11. Holzman, Franklyn D., *International Trade Under Communism: Politics and Economics*, Basic Books, New York, 1976.
12. 12. The Soviets appear to have pursued this policy in the case of exports as well. In 1982 the volume of Soviet petroleum exports was greatly increased as prices fell, presumably to maintain the planned level of hard currency export earnings.
13. 13. This model imposes the constraint that the expenditure share weighted resource elasticities sum to one. This hypothesis is, unfortunately, not directly testable since reliable data on net output and domestic resource costs are lacking. However, it is consistent with the budgeting model outlined above, which in turn is supported by the price elasticity estimates reported in Appendix B.

14. 14. Stone, J.R.N., "Linear Expenditure Systems and Demand Analysis," *Economic Journal*, No. 64, 1954, pp. 511-527; and Philips, Louis, *Applied Consumption Analysis*, North-Holland, Amsterdam, 1974.
15. 15. Samuelson, Paul, "Some Implications of Linearity," *Review of Economic Studies*, No. 15, 1947-48, pp. 88-90.
16. 16. For further details on estimating the parameters of this demand system see Appendix A. The parameter estimates are reported in Appendix B.
17. 17. United Nations, *International Statistical Yearbook of Trade*, New York, 1980, Table C; United Nations, *Monthly Bulletin of Statistics*, New York, 1983, various issues.
18. 18. *Kuelkereskedelmi Statisztikai Evkoenyv*, Koezponti Statisztikai Hivatal, Budapest, various years.
19. 19. A first-order autocorrelation was assumed for all equations except Soviet raw materials imports.
20. 20. Since the  $\beta$ 's must sum to one, the fourth  $\beta$  is predetermined.



**END**

**FILMED**

**5-85**

**DTIC**